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The Kettlebell Swing

Greg Glassman

"CrossFit is a great system, but they don't utilize kettlebells well because of a lack of qualified kettlebell instruction."

- T.C., RKC

At CrossFit we swing the kettlebell overhead while the kettlebell community swings to eye or shoulder height. No matter how many times we're admonished for our excessive swing we proceed unabated? What gives? Are we in need of additional, more "qualified", kettlebell instruction?

While admitting a penchant for iconoclasm, we are not contrary solely for the sake of being contrary. Rational foundations for our programming, exercises, and technique are fundamental to CrossFit's charter. We swim against the current only when we believe that doing so delivers a stimulus truer to our product – elite fitness.

In the March 2004 issue of the CrossFit Journal we stated that, "Criteria for (exercise) selection include, range of joint motion, uniqueness of line of action, length of line of action, strength of line of action, commonness of motor pattern, demands on flexibility, irreducibility, utility, foundational value, measurable impact on adherents, and, frankly, potential for metabolically induced comfort."

This month we apply some of these criteria to an analysis of the two kettlebell swings and then assess two other CrossFit staples, the clean & jerk and the

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"thruster" for comparison and further elucidation of our thinking in selecting exercises for regular inclusion in our program.

Examining why we've rejected the shorter, "Russian", swing, and adopted the longer, "American", swing offers an opportunity to examine and share the thinking that is part and parcel of the CrossFit method.

A little background is in order. The modern era of the kettlebell is largely the work of Russian émigré, Pavel Tsatsouline. Long ignored in the West, kettlebell training has a long and distinguished history in Russia http://www.cbass.com/Kettlebell.htm.

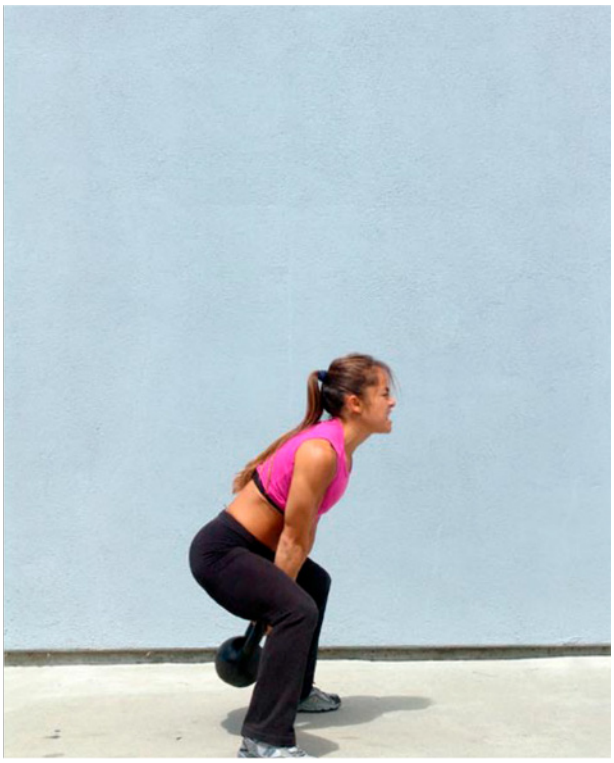
At CrossFit the rise of the kettlebell movement was cause for excitement. The kettlebell itself was somewhat unfamiliar; the kettlebell movements we'd long known from their dumbbell analogs, but Mr. Tsatsouline brought something more important than the kettlebell or kettlebell movements to the U.S. He came with a forceful and compelling rationale for high-rep weightlifting in elite strength and conditioning.

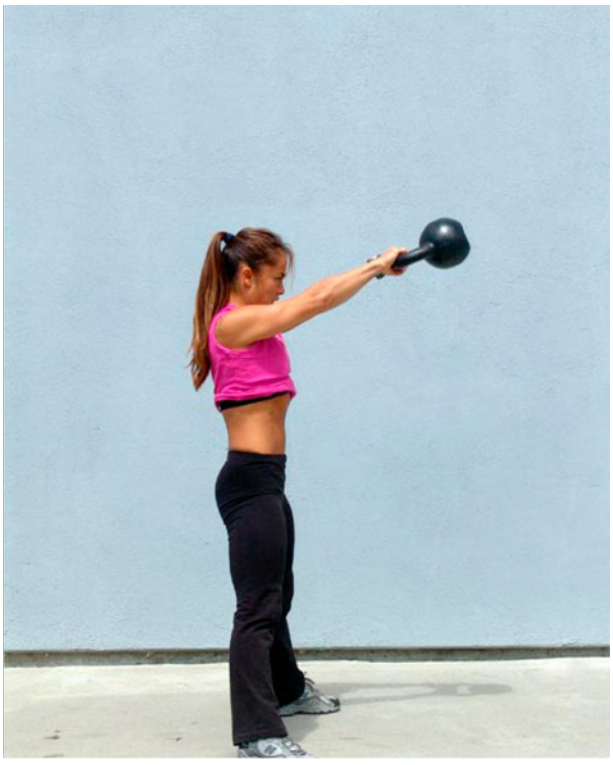
Understanding the unique potential of high rep weightlifting puts the kettlebellers and CrossFitters in rare company. Whatever else distinguishes our approaches this commonality is more important than our differences. Our two communities are, in our opinion, separated more by the number of tools we use than anything else.

On first being introduced to the kettlebell swing our immediate response was, "Why not go overhead?" Generally, we endeavor, somewhat reflexively, to lengthen the line of travel of any movement. Why?

There are two reasons. The first is somewhat intuitive. We don't do half rep pull-ups, we don't do half rep squats, and we don't do half rep push-ups. If there is a natural range of motion to any movement we like to complete it. To do otherwise seems unnatural. We would argue that partial reps are neurologically incomplete. The second reason deals with some fundamentals of physics and exercise physiology.

From physics we know that the higher we lift something, and the more it weighs, the more "work" we are performing. Work is in fact equal to the weight lifted multiplied by the height we lift the object. Work performed divided by the time to completion is equal to the average "power" expressed in the effort.





"Russian Swing"

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Power is exactly identical to the exercise physiologist's "intensity". Intensity, more than any other measurable factor, correlates to physiological response. So more work in less time, or more weight moved farther in less time, is largely a measure of an exercise's potency.

When we swing the kettlebell to overhead, the American swing, we nearly double the range of motion compared to the Russian swing and thereby double the work done each stroke. For any given time period, the power would be equivalent only if the Russian swing rate was twice the American swing rate.

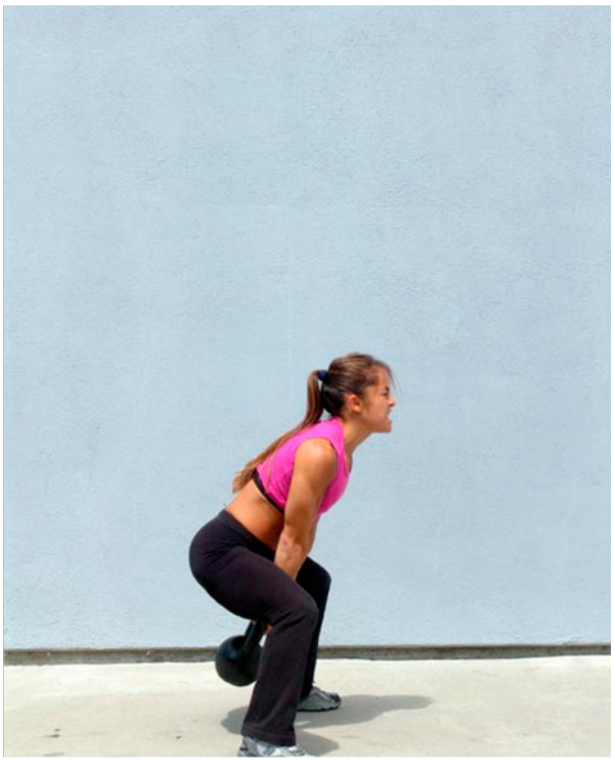
In fact, "T.C.", the gentleman who decried our lack of "qualified" instruction, recently claimed, "you will be able to get two low swings in for every one overhead." Were this true, and all other things equal, the two swings would require equal power to perform and consequently be similar in effect.

We have, however, tested the "period", or time to complete each swing, for both the American and Russian methods and we've found that the American swing rather than being half the rate of the lower Russian swing was closer to eighty-five percent of the Russian swing. This would require that the advocates of the lower, shorter, Russian swing perform the movement with nearly twice the load to improve on the power of the American swing. We don't think that is very likely to occur. Most of our guys can swing the 2-pood (32kg or 70.5lb) to overhead with control and precision.

After measuring the swing height and displacement for both the American and Russian swings we had several athletes swing 1.5 pood kettlebells, counting the repetitions, for one minute employing the Russian method. After an extended rest, we repeated the test with the same size kettlebells while employing the American swing. What we found was that the Russian swing demanded only sixty-five percent of the power required of the American swing - hardly close.

Power a measure of intensity can certainly be perceived, and it is the perception of all our athletes who have tried both swings that the longer American swing is substantially harder than the shorter Russian swing. Many offered, "it's twice as hard".

Curious about other physiological measures we repeated the tests with a downloadable heart rate monitor. Heart rate being a reliable correlate of power or intensity, we'd expect the American swing to generate higher heart



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Exercise	*Natural Frequency (reps/min)*	*Range of Motion (feet/reps)*	*Velocity (feet/min)*	*Load required to match Power (pounds)*	*Average Power (footxpounds/ min)*
American Kettlebell Swing	40	6.5	260	X	260X
Russian Kettlebell Swing	47	3.25	153	1.7X	260X
Barbell Thruster	38	3.25	124	2.1X	260X
Barbell Clean & Jerk	18	6.5	117	2.22X	260X

rates compared to the Russian method. Consistent with our calculations and our athlete's perceived exertion, the heart rates recorded while employing the American swing averaged nearly twentyfive beats per minute higher than recorded employing the Russian swing.

We analyze most of our exercises in this way. Vertical displacement, load, and period or rate of repetition are critical to measuring power or determining intensity and, collectively with heart rate and perceived exertion, lend themselves to our determination of whether an exercise is worthy of regular inclusion in our workouts. On this basis alone, the half or Russian kettlebell swing doesn't make the cut.

In examining the mechanics and physics of exercises it is readily apparent that range of motion or line of action are fairly fixed. What is less apparent but generally the case is that our exercises also have a natural period or frequency of repetition.

"Russian Swing"

"American Swing"

The natural frequency or period of an exercise can be found by performing it deliberately and quickly with an insignificant load. As we gradually increase the load what we see is that the period long remains fixed until, eventually, sufficient load slows the movement precipitously. The rate of performance prior to this threshold is the natural period or frequency of the movement.

We've seen videotape where U.S. Olympic weightlifter Shane Hamman is juxtaposed side by side clean and jerking both an empty bar and eighty percent of his max. The two movements are in perfect synch. The clean and jerk like many exercises has a natural period.

From watching videotape we've determined the natural frequency of the American kettlebell swing, the Russian swing, the thruster, and clean and jerk.

For the Russian Swing this rate is forty-seven strokes per minute, for the American swing it was forty, for the "thruster" (front squat/push-press) thirtyeight, and for the "touch and go" clean and jerk it was 18 strokes per minute.

Similarly, we analyzed the range of motion for these movements and found that the Russian kettlebell swing and thruster both traveled about three and a quarter feet and that the American swing and clean & jerk both traveled about six and one half feet. All of these measures were averaged from two male athletes standing nearly six feet tall.

Knowing the range of motion and natural period of these exercises we can determine what loads would be required to produce equivalent expressions of power among the four exercises. The answers are revealing.

Using this information we can show that the Russian kettlebell swing would have to be performed with loads nearly twice that of the American swing to exact similar power and intensity demands. This may not be possible.

In the case of the thruster and the clean & jerk the loads would have to be a little over twice as large and this is readily doable.

Indeed, it is our considered opinion that the Russian kettlebell swing becomes too heavy before it approaches the power of our preferred American kettlebell swing and that the thruster and clean and jerk are both vehicles for outpacing the power demands of the American swing. Physical analysis, measured heart rates, observed impact, and our athlete's perceived exertion support these contentions beautifully.

Greg Glassman is the Founder of CrossFit, Inc. and Crossfit Santa Cruz and is the publisher of the CrossFit Journal. He is a former competitive gymnast and has been a fitness trainer and conditioning coach since the early 1980s.